



Engineering Solutions & Electromagnetic Compatibility Services

**FCC Part 15.225 & Industry Canada RSS-210
Certification Application Report**

Test Lab: Rhein Tech Laboratories, Inc. Tel: 703-689-0368 360 Herndon Parkway Fax: 703-689-2056 Suite 1400 www.rheintech.com Herndon, VA 20170 E-Mail: atcbinfo@rheintech.com		Applicant: Medeco Security Locks 3626 Alleghany Drive Salem, VA 24153 (USA) Contact: David Smith dsmith@medeco.com	
FCC/IC ID	VR3-101500X 7465A-101500X	Test Report Date	October 3, 2012
Platform	N/A	RTL Work Order #	2012180
Model #'s	10-15007 & 10-15009	RTL Quote #	QRTL12-180A
American National Standard Institute	ANSI C63.4-2003: Methods of Measurement of Radio-Noise Emissions from Low-Voltage Electrical and Electronic Equipment in the Range of 9 kHz to 40 GHz		
FCC Classification	DXX – Part 15 Low Power Communication Device Transmitter		
FCC Rule Part(s)/Guidance	FCC Rules Part 15.225: Operation within the band 13.110-14.010 MHz (10-01-11)		
Industry Canada	RSS-210 Issue 8: Low Power License-Exempt Communications Devices RSS-Gen: Issue 3; 2010 General Requirements and Information for the Certification of Radio Apparatus		
Digital Interface Information	Digital Interface was found to be compliant		
Frequency Range (MHz)	Output Power (W)	Frequency Tolerance	Emission Designator
13.56	N/A	N/A	51K3FXD

I, the undersigned, hereby declare that the equipment tested and referenced in this report conforms to the identified standard(s) as described in this test report. No modifications were made to the equipment during testing in order to achieve compliance with these standards. Furthermore, there was no deviation from, additions to, or exclusions from, the applicable parts of FCC Part 2, FCC Part 15, RSS-210, and ANSI C63.4.

Signature: 

Date: October 3, 2012

Typed/Printed Name: Desmond A. Fraser

Position: President

This report may not be reproduced, except in full, without the written approval of Rhein Tech Laboratories, Inc. and Medeco Security Locks, Inc. The test results relate only to the item(s) tested.

These tests are accredited and meet the requirements of ISO/IEC 17025 as verified by ANSI-ASQ National Accreditation Board/ACLASS. Refer to certificate and scope of accreditation AT-1445.

Table of Contents

1	General Information	4
1.1	Scope	4
1.2	Description of EUT	4
1.3	Test Facility	4
1.4	Related Submittal(s)/Grant(s)	4
1.5	Modifications	4
2	Test Information	5
2.1	Description of Test Modes	5
2.2	Exercising the EUT	5
2.3	Test Result Summary	5
2.4	Test System Details	6
2.5	Configuration of Tested System	6
3	Radiated Emissions – FCC §15.209, §15.225(a)&(d); IC RSS-210 §A2.6; RSS-Gen	7
3.1	Limits of Radiated Emissions Measurement	7
3.2	Radiated Emissions Measurement Test Procedure	7
3.3	Radiated Emissions Test Results	8
3.4	Radiated Emissions Harmonics/Spurious Test Data	9
3.5	Radiated Emissions Digital Test Data	9
4	AC Conducted Emissions - FCC §15.207; IC RSS-Gen §7.2.4: Conducted Limits	10
5	20 dB Bandwidth – IC RSS-Gen	10
5.1	20 dB Bandwidth Test Procedure	10
5.2	20 dB Modulated Bandwidth Test Data	10
5.3	20 dB Bandwidth Plots	11
6	Frequency Stability – FCC §2.1055, §15.225(e): Frequency Stability; IC RSS-119 §5.3 Transmitter Frequency Stability	12
6.1	Test Procedure	12
6.2	Test Data	12
7	Conclusion	13

Figure Index

Figure 2-1: Configuration of System Under Test.....	6
---	---

Table Index

Table 2-1: Channels Tested	5
Table 2-2: Test Result Summary – FCC Part 15, Subpart C (Section 15.225).....	5
Table 2-3: Equipment Under Test	6
Table 3-1: Radiated Emissions Test Equipment	8
Table 3-2: Radiated Emissions Test Data (Fundamental)	8
Table 3-3: Radiated Emissions Harmonics/Spurious	9
Table 3-4: Digital Radiated Emissions Test Data.....	9
Table 5-1: 20 dB Bandwidth Test Equipment.....	10
Table 5-2: 20 dB Modulated Bandwidth Test Data	10
Table 6-1: Frequency Stability Test Equipment	12
Table 6-2: Temperature Frequency Stability	12
Table 6-3: Voltage Frequency Stability at 20°C	13

Plot Index

Plot 5-1: 20 dB Bandwidth - 13.56 MHz	11
---	----

Appendix Index

Appendix A: Agency Authorization Letter	14
Appendix B: FCC Confidentiality Request Letter.....	15
Appendix C: FCC Part 15 Unlicensed Modular Transmitter Approval.....	16
Appendix D: IC Letters	17
Appendix E: Canadian Based Representative Attestation Letter	18
Appendix F: IC Confidentiality Request Letter	19
Appendix G: Label and Label Location	20
Appendix H: Technical Operational Description	21
Appendix I: Schematics	22
Appendix J: Block Diagram	23
Appendix K: Manual.....	24
Appendix L: Test Photographs	25
Appendix M: External Photographs	27
Appendix N: Internal Photographs	28

Photograph Index

Photograph 1: Radiated Testing – Front View	25
Photograph 2: Radiated Testing – Rear View	26

1 General Information

1.1 Scope

This is an original certification application request for the Medeco Security Locks, Inc. Aperio M100 Wireless Lock, Model # 10-15007 and Model # 10-15009.

Applicable Standards:

- FCC Part 15.225: Operation within the band 13.110-14.010 MHz
- Industry Canada RSS-210: Low Power License-Exempt Communications Devices

1.2 Description of EUT

Equipment Under Test	Transceiver
Model/Model #	Aperio M100 Wireless Lock/10-15007 & 10-15009
Power Supply	3 VDC "CR21" size cell
Modulation Type	ASK
Frequency Range	13.56 MHz
Antenna Connector Type	Chip
Antenna Type	Internal

1.3 Test Facility

The open area test site and conducted measurement facility used to collect the radiated data is located at 360 Herndon Parkway, Suite 1400, Herndon, Virginia 20170. This site has been fully described in a report and approved by the Federal Communications Commission to perform AC line conducted and radiated emissions testing (ANSI C63.4-2003).

1.4 Related Submittal(s)/Grant(s)

This is an original certification application for Medeco Security Locks, Inc. Aperio M100 Wireless Lock, Model #s: 10-15007 and 10-15009, FCC ID: VR3-101500X, IC: 7465A-101500X. IC will require a family certification.

1.5 Modifications

No modifications were made to the equipment during testing in order to achieve compliance with these standards.

2 Test Information

2.1 Description of Test Modes

Table 2-1: Channels Tested

Frequency (MHz)
13.56

2.2 Exercising the EUT

The EUT was supplied with test firmware programmed with a high, mid, and low channel for testing as well as a low, mid, and high power. The EUT was tested in all three orthogonal planes in order to determine worst-case emissions. The EUT was provided with software to continuously transmit during testing. The carrier was also checked to verify that information was being transmitted.

2.3 Test Result Summary

Table 2-2: Test Result Summary – FCC Part 15, Subpart C (Section 15.225)

Standard	Test	Pass/Fail or N/A
FCC 15.207	AC Power Conducted Emissions	N/A
FCC 15.209	Radiated Emissions	Pass
FCC 15.225(a)and(d)	Field Strength of Fundamental and Harmonics	Pass
RSS-Gen	20 dB Bandwidth	Pass

2.4 Test System Details

The test samples were received on September 25, 2012. The FCC identifiers for all applicable equipment, plus descriptions of all cables used in the tested system, are identified in the following table.

Table 2-3: Equipment Under Test

Part	Manufacturer	Model	Serial Number	FCC ID	Cable Description	RTL Bar Code
Wireless Lock	Medeco Security Locks, Inc.	Aperio M100 Model #'s 10-15007 & 10-15009	N/A	VR3- 101500X	N/A	20837

2.5 Configuration of Tested System

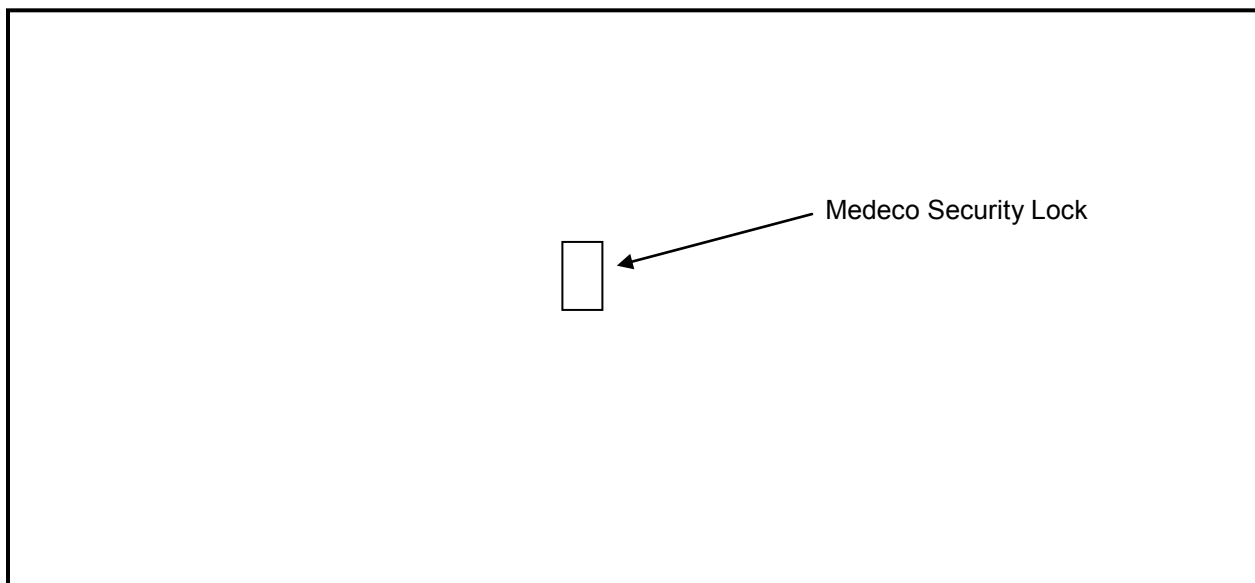


Figure 2-1: Configuration of System Under Test

3 Radiated Emissions – FCC §15.209, §15.225(a)&(d); IC RSS-210 §A2.6; RSS-Gen

3.1 Limits of Radiated Emissions Measurement

Frequency (MHz)	Field Strength (uV/m)	Measurement Distance (m)
0.009-0.490	2400/f (kHz)	300
0.490-1.705	2400/f (kHz)	30
1.705-30.0	30	30
30-88	100	3
88-216	150	3
216-960	200	3
Above 960	500	3

As shown in 15.35(b), for frequencies above 1000 MHz, the field strength limits are based on average detector, however, the peak field strength of any emission shall not exceed the maximum permitted average limits specified above by more than 20 dB under any circumstances of modulation.

15.225(a) states “The field strength of any emissions within the band 13.553–13.567 MHz shall not exceed 15,848 microvolts/meter at 30 meters.”

$20\log(15,848)=84$ dBuV/m at 30 m and $40*\log(30/3)=40$, $84+40=124$ dBuV/m at 3 m.

3.2 Radiated Emissions Measurement Test Procedure

Before final measurements of radiated emissions were made on the open-field three/ten meter range, the EUT was scanned indoors at one and three meter distances. This was done in order to determine its emissions spectrum signature. The physical arrangement of the test system and associated cabling was varied in order to determine the effect on the EUT's emissions in amplitude, direction and frequency. This process was repeated during final radiated emissions measurements on the open-field range, at each frequency, in order to ensure that maximum emission amplitudes were attained.

Final radiated emissions measurements were made on the three/ten-meter, open-field test site. The EUT was placed on a nonconductive turntable 0.8 meters above the ground plane. The spectrum was examined from 9 kHz to the 10th harmonic of the highest fundamental transmitter frequency (135.6 MHz).

At each frequency, the EUT was rotated 360°, and the antenna was raised and lowered from 1 to 4 meters in order to determine the emission's maximum level. Measurements were taken using both horizontal and vertical antenna polarizations. For frequencies between 30 and 1000 MHz, the spectrum analyzer's 6 dB bandwidth was set to 120 kHz, and the analyzer was operated in the CISPR quasi-peak detection mode. For emissions above 1000 MHz, emissions are measured using the average detector function with a minimum resolution bandwidth of 1 MHz. No video filter less than 10 times the resolution bandwidth was used. The highest emission amplitudes relative to the appropriate limit were measured and recorded in this report.

Table 3-1: Radiated Emissions Test Equipment

RTL Asset #	Manufacturer	Model	Part Type	Serial Number	Calibration Due Date
900151	Rohde and Schwarz	HFH2-Z2	Loop Antenna (9 kHz-30 MHz)	827525/019	10/1/13
901595	Mini-Circuits	ZHL-4240V	Amplifier	H090293-5	2/17/13
900878	Rhein Tech Laboratories	AM3-1197-0005	3 meter antenna mast, polarizing	Outdoor Range 1	Not Required
901242	Rhein Tech Laboratories	WRT-000-0003	Wood rotating table	N/A	Not Required
901581	Rohde & Schwarz	1166.1660.50	Spectrum Analyzer	2001006	6/3/13
900791	Chase	CBL6111B	Bilog Antenna (30 MHz-2000 MHz)	N/A	1/31/13
901592	Insulated Wire Inc.	KPS-1503-3600-KPR	SMK RF Cables 20'	NA	8/16/13
901593	Insulated Wire Inc.	KPS-1503-360-KPR	SMK RF Cables 36"	NA	8/16/13

3.3 Radiated Emissions Test Results

Table 3-2: Radiated Emissions Test Data (Fundamental)

Emission Frequency (MHz)	Average Analyzer Reading (dBuV/m)	Site Correction Factor (dB/m)	Average Corrected (dBuV/m)	Average Limit (dBuV/m)	Average Margin (dB)
13.56	72.8	20.0	92.8	124.0	-31.2

* testing performed at 1m, interpolated to 3m.

3.4 Radiated Emissions Harmonics/Spurious Test Data

Table 3-3: Radiated Emissions Harmonics/Spurious

Emission Frequency (MHz)	Analyzer Reading (dBUV/m)	Site Correction Factor (dB/m)	Corrected (dBUV/m)	Limit (dBUV/m)	Margin (dB)
27.121	26.2	21.6	47.8	69.5	-21.7
40.680	9.5	-28.6	-19.1	40.0	-59.1
54.240	17.6	-34.3	-16.7	40.0	-56.7
67.800	11.4	-35.2	-23.8	40.0	-63.8
81.361	11.8	-33.5	-21.7	40.0	-61.7
94.921	20.1	-30.8	-10.7	43.5	-54.2
108.481	10.1	-28.9	-18.8	43.5	-62.3
122.041	8.1	-29.1	-21.0	43.5	-64.5
135.602	15.0	-30.0	-15.0	43.5	-58.5

* testing performed at 1m, interpolated to 3m.


3.5 Radiated Emissions Digital Test Data

Table 3-4: Digital Radiated Emissions Test Data

Temperature: 70°F Humidity: 94%										
Emission Frequency (MHz)	Test Detector	Antenna Polarity (H/V)	Turntable Azimuth (deg)	Antenna Height (m)	Analyzer Reading (dBUV)	Site Correction Factor (dB/m)	Emission Level (dBUV/m)	Limit (dBUV/m)	Margin (dB)	Pass/Fail
30.795	Qp	V	0	1.0	30.2	-23.7	6.5	40.0	-33.5	Pass
31.833	Qp	V	0	1.0	31.7	-24.3	7.4	40.0	-32.6	Pass
36.079	Qp	V	0	1.0	33.7	-26.4	7.3	40.0	-32.7	Pass
37.114	Qp	V	0	1.0	34.6	-26.9	7.7	40.0	-32.3	Pass
37.162	Qp	V	0	1.0	34.6	-26.9	7.7	40.0	-32.3	Pass
38.200	Qp	V	0	1.0	34.0	-27.4	6.6	40.0	-33.4	Pass
39.238	Qp	V	0	1.0	34.9	-27.9	7.0	40.0	-33.0	Pass
1139.045	Av	V	0	1.0	36.3	-14.7	21.6	54.0	-32.4	Pass
1125.496	Av	V	0	1.0	40.0	-15.2	24.8	54.0	-29.2	Pass

Test Personnel:

Daniel W. Baltzell
Test Engineer



Signature

October 3, 2012
Date of Test

4 AC Conducted Emissions - FCC §15.207; IC RSS-Gen §7.2.4: Conducted Limits

No AC conducted tests are required since the device is powered solely by a 3 VDC "CR2" size cell.

5 20 dB Bandwidth – IC RSS-Gen

5.1 20 dB Bandwidth Test Procedure

The minimum 20 dB bandwidths per RSS-Gen were measured using a 50-ohm spectrum analyzer. The modulated carrier was adjusted on the analyzer so that it was displayed entirely on the spectrum analyzer. The sweep time was auto and allowed through several sweeps with the max hold function used in peak detector mode. The resolution bandwidth was set to 100 kHz, and the video bandwidth set to 1 MHz. The table below contains the bandwidth measurement results.

Table 5-1: 20 dB Bandwidth Test Equipment

RTL Asset #	Manufacturer	Model	Part Type	Serial Number	Calibration Due Date
901581	Rohde & Schwarz	1166.1660.50	Spectrum Analyzer	2001006	6/3/13

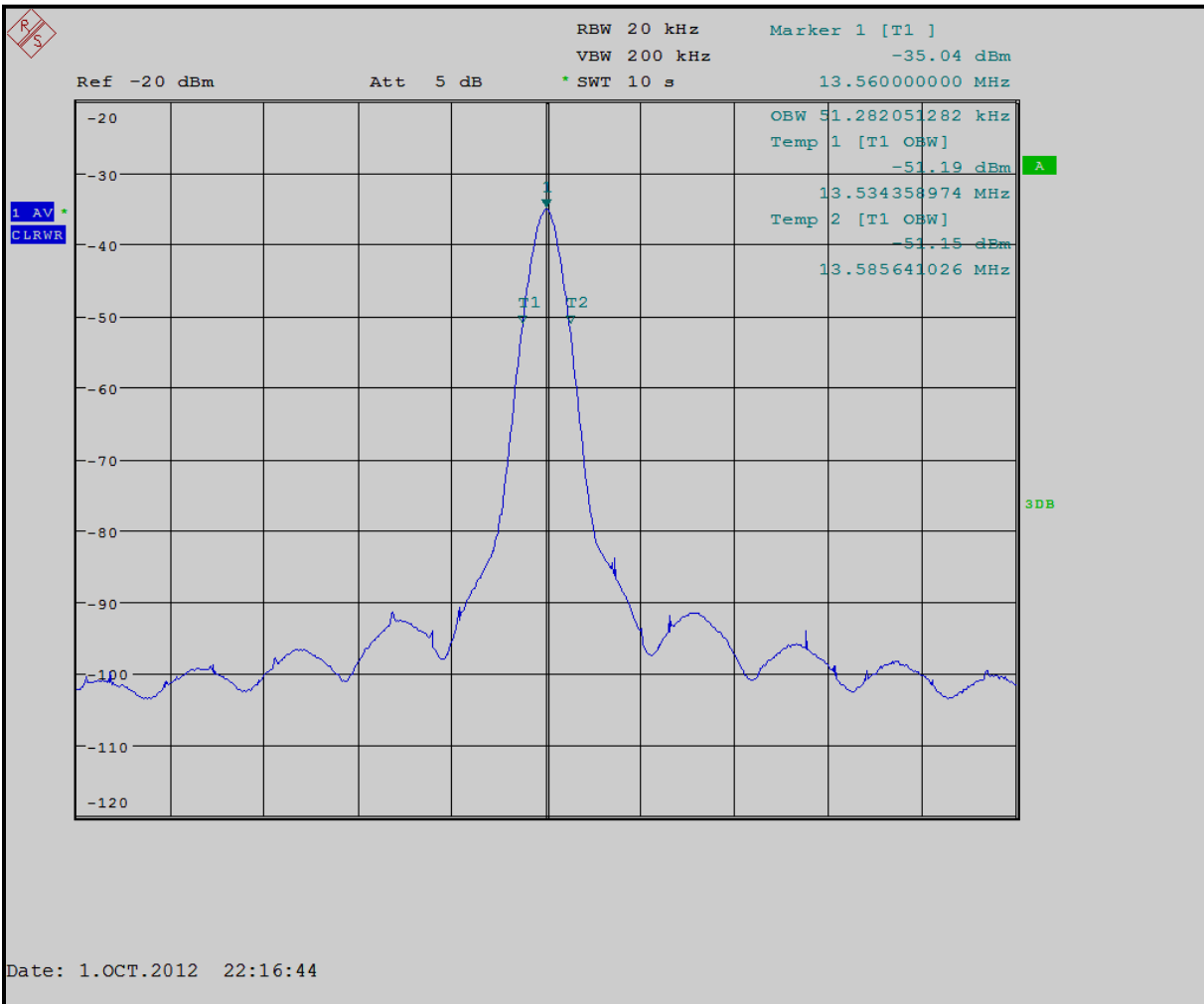
5.2 20 dB Modulated Bandwidth Test Data

Table 5-2: 20 dB Modulated Bandwidth Test Data

Minimum 20 dB bandwidths	
Channel	20 dB Bandwidth (kHz)
1	51.3

5.3 20 dB Bandwidth Plots

Plot 5-1: 20 dB Bandwidth - 13.56 MHz



Test Personnel:

Daniel W. Baltzell
Test Engineer

Signature

October 1, 2012
Date of Test

6 Frequency Stability – FCC §2.1055, §15.225(e): Frequency Stability; IC RSS-119 §5.3 Transmitter Frequency Stability

6.1 Test Procedure

ANSI/TIA/EIA-603-2004, section 2.2.2

The carrier frequency stability is the ability of the transmitter to maintain an assigned carrier frequency.

15.255(e): The frequency tolerance of the carrier signal shall be maintained within $\pm .01\%$ of the operating frequency over a temperature variation of -20°C to $+50^{\circ}\text{C}$ at normal supply voltage, and for a variation in the primary supply voltage from 85% to 115% of the rated supply voltage at a temperature of 20°C . For battery operated equipment, the equipment tests shall be performed using a new battery.

The EUT was evaluated over the temperature range -20°C to $+50^{\circ}\text{C}$.

The temperature was initially set to -20°C and a 1-hour period was observed for stabilization of the EUT. The frequency stability was measured within one minute after application of primary power to the transmitter. The temperature was raised at intervals of 10 degrees centigrade through the range. A $\frac{1}{2}$ -hour period was observed to stabilize the EUT at each measurement step and the frequency stability was measured within one minute after application of primary power to the transmitter. Additionally, the power supply voltage of the EUT was varied $\pm 15\%$ nominal input voltage.

The worst-case deviation was found to be 0.0019 % of operating frequency.

Table 6-1: Frequency Stability Test Equipment

RTL Asset #	Manufacturer	Model	Part Type	Serial Number	Calibration Due Date
900946	Tenney Engineering, Inc.	TH65	Temperature Chamber with Humidity	11380	1/13/13
901581	Rohde & Schwarz	1166.1660.50	Spectrum Analyzer	2001006	6/3/13
901350	Meterman	33XR	Multimeter	040402802	12/28/12
N/A	Hewlett Packard	6024A	DC Power Supply	1912A00331	N/A

6.2 Test Data

Table 6-2: Temperature Frequency Stability

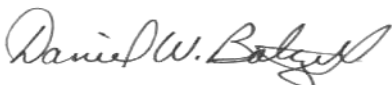
Temperature ($^{\circ}\text{C}$)	Measured Frequency (Hz)	Percent of Operating Frequency
-20	13.56026282	0.0019
-10	13.56023077	0.0017
0	13.56026282	0.0019
10	13.56026282	0.0019
20 (reference)	13.56026282	0.0019
30	13.56023077	0.0017
40	13.56019872	0.0015
50	13.56016667	0.0012

Table 6-3: Voltage Frequency Stability at 20°C

Voltage (DC)	Measured Frequency (Hz)	Percent of Operating Frequency
2.55	13.56022400	0.0017
3.00	13.56021635	0.0016
3.45	13.56021154	0.0016

Results: The EUT is compliant.

Test Personnel:

Daniel Baltzell		October 2, 2012
Test Engineer	Signature	Date of Tests

7 Conclusion

The data in this measurement report shows that the EUT as tested, Medeco Security Locks, Inc., Model: Aperio M100 Wireless Lock, Model #'s 10-15007 and 10-15009, FCC ID: VR3-101500X, IC: 7465A-101500X, complies with all the applicable requirements of Parts 2 and 15 of the FCC Rules and Regulations, and IC RSS-210 and RSS-Gen.